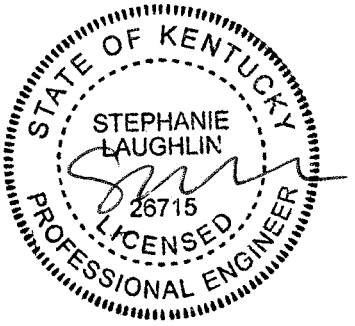
Derek R. Guthrie
Water Quality Treatment Center
Regional Facilities Plan
2017

October 2017

Prepared for Kentucky Division of Water
300 Sower Blvd
Frankfort, KY 40601
P: 502.564.3410

Prepared by Louisville MSD
700 West Liberty Street
Louisville, KY 40203-1911
P : 502.540.6000

Derek R. Guthrie
Water Quality Treatment Center
Regional Facilities Plan
2017



October 2017

Prepared for Kentucky Division of Water
300 Sower Blvd
Frankfort, KY 40601
P: 502.564.3410

Prepared by Louisville MSD
700 West Liberty Street
Louisville, KY 40203-1911
P : 502.540.6000

TABLE OF CONTENTS

TABLES **SECTION**

FIGURES **SECTION**

ATTACHMENTS

APPENDIX A CROSS CUTTER CORRESPONDANCE AND MITIGATION

APPENDIX B MSD RATES

SECTION 1: REGIONAL FACILITIES PLAN SUMMARY

1.1 INTRODUCTION AND BACKGROUND

A Regional Facilities Plan (RFP) is a comprehensive plan for the management of wastewater collection and treatment facilities. Planning is intended to define the most appropriate "local" solution to providing wastewater service (collection and treatment) for a defined planning area over a defined period of time. The goal of the RFP is to ultimately protect the environment and human health by providing reliable wastewater collection and treatment for areas of greatest need. The RFP is ultimately reviewed and approved by the Kentucky Division of Water (KDOW). KDOW requires a checklist be submitted with the completed RFP, which is attached in Section 12 for reference. Review and approval considers environmental and state clearinghouse reviews in addition to technical review.

Louisville is an incorporated city located in Jefferson County, Kentucky. Louisville and Jefferson County Metropolitan Sewer District (MSD) identified an in-house team, with assistance from CH2M Engineers, Inc. to evaluate the Derek R. Guthrie (DRG) Water Quality Treatment Center (WQTC) wastewater conveyance and treatment needs for a 20-year planning period ending in 2036.

1.2 PURPOSE OF THE PLAN

The DRG Planning Area is shown in Figure 1-1. MSD is required under an Amended Consent Decree (ACD) with the United States Environmental Protection Agency (USEPA), the Kentucky Department for Environmental Protection (KDEP) and the United States Department of Justice (DOJ) to reduce combined sewer overflows (CSOs) and eliminate sanitary sewer overflows (SSOs) throughout MSD's system.

In 2008 MSD completed and USEPA/KDEP approved the Interim Sanitary Sewer Discharge Plan. The ISSDP included a project to increase the wet weather capacity at the Derek R. Guthrie WQTC to 200 MGD in order to convey and provide full secondary treatment for additional sanitary sewer system (SSS) wet weather flows resulting from implementing overflow abatement projects. In addition the ISSDP defined an approach to reduce CSOs by diverting flow away from part of the sanitary sewer service area tributary to the Morris Forman (MF) WQTC and routing the flow to the new wet weather treatment facilities at the DRG WQTC as flows dictate and capacity is available at the DRG WQTC. The Northern Ditch

Figure: 1-1

DEREK R. GUTHRIE FACILITES PLAN UPDATE
LOUISVILLE AND JEFFERSON COUNTY
METROPOLITAN SEWER DISTRICT

PLANNING AREA LOCATION

MSD Regional Treatment Plant
MSD Treatment Plant
Private Treatment Plant
Streams
Expressway
Major Roads
Jefferson County Boundary
Pond Creek Watershed
Mill Creek Watershed
Currently Not Serviced
Planning Area Boundary

N
W E
S

0 0.75 1.5 Miles

1 inch equals 1.5 miles

Map Prepared by MSD GIS Services and Records

Map Created: 7-APR-2017

J:\msd\SharedMaps\DRG Action Plan Update\MXDs\Planning_Area_Location.mxd

Diversion Structure allows wet weather flow to be diverted from the Morris Forman sewer service area to the Derek R. Guthrie sewer service area. This wet weather diversion allows for an overall reduction in CSO volume and an improvement overall water quality.

The ISSDP projects were later incorporated into the Integrated Overflow Abatement Plan (IOAP) which was submitted to EPA/KDEP in 2008 and approved and incorporated into MSD's Amended Consent Decree by reference in 2009. All the projects defined in the ISSDP have been constructed and put into operation in accordance with the approved schedule.

The main purpose of this RFP is to assemble a long-range plan for continuing to provide effective and efficient sanitary sewer service to MSD customers in this planning area. The RFP will also be used to identify the improvements required, and their recommended priority and timing, to meet projected customers' needs in the next 20 years. MSD commissioned this RFP to evaluate the existing DRG WQTC wastewater collection system and treatment facilities, establish any additional sewer service needs, evaluate alternatives, and develop design and construction schedules and budgets for the recommended plan.

1.3 RECOMMENDED ALTERNATIVE

The recommended alternative is a re-rating of the DRG WQTC capacity from the current 30 million gallons per day (mgd) Average Daily Flow (ADF) to 60 mgd. The new capacity is due to the increase in treatment processes constructed to treat wet weather flow diversions from some of the sanitary sewers normally tributary to the MF WQTC as identified in the Integrated Overflow Abatement Plan (IOAP). The wet weather diversions of sanitary sewage diluted by residual rainfall-derived infiltration and inflow increase the ADF significantly when calculated over the entire year. To account for this increased overall loading additional modifications shown in Table 1-1 have been recommended. These modifications include increased capacity for Return Activated Sludge (RAS) pumps and piping, replaced air piping for the aeration basins and mechanical rehabilitation of three existing clarifiers. The modifications to the plant and increases in treatment capacity are described in detail in Sections 6 and 8 of this document.

Table 1-1 Recommended WQTC Projects

WQTC Projects	Status
Northern Ditch Diversion Project	Completed October 2010
DRG Wet Weather Capacity Increase?	Operational November 2012
Mechanical Rehabilitation of Existing Clarifiers	Completed May 2017
Return Activated Sludge Pump and Piping Upgrades	Will be completed October 2018
Air Piping Replacement for Aeration Basins	Planning Phases

The conclusions presented in this RFP will be included in support of an application to modify the KPDES permit for the plant, increasing the rated capacity of the DRG WQTC as described herein.

1.4 COST OF PROPOSED PLAN

The projected cost of the work needed to meet the requirements for re-rating the DRG WQTC to 60 mgd ADF is $2 million. The projected cost of the work described in the Collection System alternatives in Table 8-2 is $29,611,000. The projected cost of the IOAP projects in the DRG WQTC Planning area during the period covered by this RFP is $9,917,000. Potential assessment projects are estimated at $16,275,000.

1.5 PLANNING AGENCY COMMITMENTS TO IMPLEMENT THE PLAN

MSD has the authority to prepare and implement the recommended projects since it addresses the needs within the existing DRG Planning Area. All recommended projects will be reviewed and approved by KDOW before construction permits can be issued.

1.6 SCHEDULE OF IMPLEMENTATION FOR RECOMMENDED PROJECTS

The plant improvements required in addition to the work completed under the IOAP wet weather program are scheduled to be completed within 12 months of approval of this facility plan.

Tables 8.2, 8.3 and 8.4 list the general timeframe for the start of the proposed projects.

SECTION 2: STATEMENT OF PURPOSE AND NEED

2.1 INTRODUCTION

An RFP is a comprehensive plan for the management of wastewater collection and treatment facilities. The intent of an RFP is to define the most appropriate "local" solution to providing wastewater collection and treatment for a specific planning area over a defined period of time. Typically the period of time is 20 years; however other periods of time can be used.

An RFP may be required for several reasons including:

1. A specific request of KDOW
2. By regulation (401 KAR 5:006, Section 2)
3. As part of an enforcement action (Agreed Order)

A KDOW request could be triggered by a treatment facility being over 90 percent of its design capacity or because of a KDOW sponsored watershed initiative. Regulation 401 KAR 5:006, Section 2 requires an RFP or update to an RFP for any of the following reasons:

- A new regional planning plant is proposed.
- The equivalent population served by an existing wastewater collection system increases by 30 percent or more from the previous Facilities Plan.
- The average daily flow design capacity at an existing treatment plant increases by over 30 percent.

2.2 PURPOSE AND SCOPE

The Derek R. Guthrie WQTC RFP 2016 is a planning step for the expansion of the wastewater collection and treatment services in the southwestern area of Jefferson County. The main purpose of the RFP is to provide MSD with a near-term plan for providing effective and efficient sanitary sewer service to its customers. Another purpose is to identify the improvements required and their recommended priority and timing to meet projected customers' needs for the next 20 years.

Through this planning effort, MSD evaluated the existing wastewater collection system and treatment facilities, established sewer service needs, evaluated alternatives and developed design and construction schedules and budgets. MSD currently serves the planning area by operation of Derek R Guthrie regional WQTC.

This report describes the condition and capacity of existing conveyance and wastewater

treatment facilities in the planning area. A specific plan for conveyance and wastewater treatment facilities improvements is developed based on current and future system needs. Alternatives for conveyance of growth areas are identified and evaluated. The recommended alternatives for the identified needs are prioritized and supported by an evaluation of monetary costs and nonmonetary considerations.

2.3 REGULATORY CONSIDERATIONS

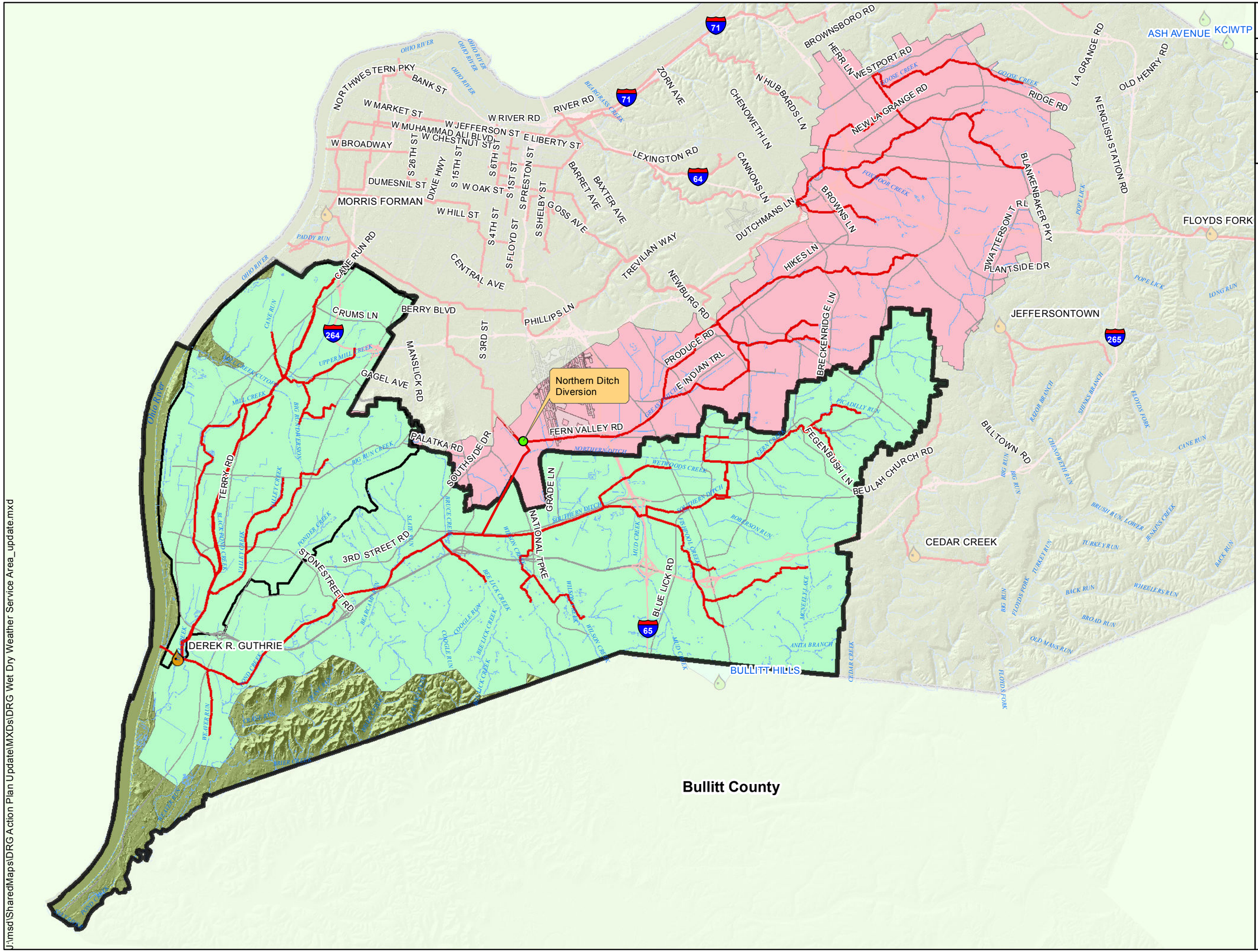
Louisville and Jefferson County Metropolitan Sewer District (MSD) has committed to take necessary measures for controlling sewer overflows and other unauthorized discharges under a federal Consent Decree entered into Federal Court on August 12, 2005. The Consent Decree is between MSD, the US Department of Justice, the U.S. Environmental Protection Agency (EPA) and the Kentucky Department for Environmental Protection (KDEP). The Consent Decree was amended in 2009. In accordance with the requirements of the Amended Consent Decree (ACD), MSD prepared a comprehensive plan to reduce and mitigate the effects of wet weather combined sewer overflows (CSOs), and to eliminate sanitary sewer overflows (SSOs) and other unauthorized discharges. This comprehensive plan, known as the Integrated Overflow Abatement Plan (IOAP) integrates these system improvements into one coordinated response. In an early action activity MSD prepared the Interim Sanitary Sewer Discharge Plan (ISSDP). In the ISSDP MSD specified projects that will significantly reduce unauthorized discharges in four high-priority areas of the sanitary sewer collection system: Beechwood Village, the Hikes Point area, the Highgate Springs Pump Station and the Southeastern Diversion Structure. Implementation of these identified projects will cause significant, additional wet weather flow to be conveyed to the DRG WQTC. At the time the ISSDP was prepared the rated capacity of the DRG WQTC was 30 MGD, with a peak wet weather treatment capacity of 100 MGD. MSD created three major projects for designing and building an expanded wet weather treatment facility because the existing WQTC does not have the necessary treatment capacity for accepting the projected peaks.

The IOAP also recommended diversion to the DRG WQTC a portion of the sanitary sewer flow normally tributary to the combined sewer system of the MF WQTC. Figure 2-1 shows the dry weather service area and the wet weather diversion area. This would reduce CSOs by removing some on the sanitary sewage from the combined sewer system. As a result of the IOAP approach new infrastructure was constructed so that wet weather flow can now be diverted upstream of the Southeast Diversion into the Northern Ditch Interceptor. When this interceptor approaches the Northern Ditch Pump Station all or some of the flow in the Northern Ditch Interceptor can be diverted out of the MF WQTC service area and into the Pond Creek

Figure: 2-1

DEREK R. GUTHRIE FACILITES PLAN UPDATE
LOUISVILLE AND JEFFERSON COUNTY
METROPOLITAN SEWER DISTRICT

DRG WQTC
DRY & WET WEATHER
SEWER SERVICE AREA



- MSD Regional Treatment Plant
- MSD Treatment Plant
- Private Treatment Plant
- Streams
- Expressway
- Major Roads
- Jefferson County Boundary
- Planning Area Boundary
- MajorCollectionSystem
- Dry Weather Service Area
- Wet Weather Service Area
- Currently Not Serviced

N
W E
S

0 1 2 Miles

1 inch equals 2 miles

Map Prepared by MSD GIS Services and Records

Map Created: 7-APR-2017

J:\msd\SharedMaps\DRG Action Plan Update\MXDs\DRG Wet Dry Weather Service Area_update.mxd

Interceptor which then flows to the DRG WQTC. Note that this diversion is closely controlled to ensure that diversion only occur when downstream capacity is available.

This facility is now capable of providing full secondary treatment for 200 MGD of wet weather flow. The expansion of treatment capacity also allows for more treatment of dry weather flow from the normal DRG service area. The diversion of wet weather flow also contributes to a significant increase in the annual average flow treated by the plant, separate from any growth in customers in the dry weather service area. A request to rerate the DRG WQTC from an average daily flow of 30 MGD to 60 MGD is outlined in this RFP. This change in capacity will accommodate the projected increase in service from both residential and commercial growth for the next twenty years, and also account for the increase in overall flow treated due to the wet weather diversions.

The expansion of the DRG WQTC to provide wet weather treatment capacity is described with loadings, process changes, and design data in Sections 6 and 8.

SECTION 3: PHYSICAL CHARACTERISTICS

The DRG WQTC Planning Area, according to the Kentucky Atlas and Gazetteer, is located in the Outer Bluegrass physiographic region. The Outer Bluegrass physiographic region is underlain by limestone and bordered by the Ohio River in the north and by the Knobs in the south, west, and east. The Bluegrass physiographic region has been used extensively for pastureland.

3.1 PLANNING AREA BOUNDARY

The DRG WQTC planning area is in the southwestern sector of the MSD service area. The area is bounded on the west by the Ohio River, on the north by the MF WQTC service area, on the east by the Cedar Creek WQTC service area and on the south by Bullitt County. See Figure 1-1.

The boundary of the DRG WQTC and Morris Forman (MF) WQTC service area reflects a division of areas served by separate sewers being tributary to the DRG WQTC and separate sewer areas tributary to the MF WQTC. As a result of the IOAP approach to CSO control the boundaries of the MF and DRG service areas overlap during certain wet weather events. A full description of the wet weather operation strategy is in Section 6 of this report. Figure 2-1 shows the dry weather service area and the wet weather diversion area. Figure 3-1 depicts existing wastewater infrastructure in the dry weather planning area. The point of connection occurs at the diversion of flow from the Northern Ditch Pump Station to the Pond Creek Interceptor. MSD controls when diversions occur based on flow conditions and capacity at DRG WQTC. MSD has the flexibility to operate using real time control system or in manual mode. For the purposes of this RFP, the original DRG planning area (dry weather service area) will be used for the evaluation of development and growth and the need for additional conveyance and treatment capacity under normal dry weather conditions. The flow from the wet weather diversion area is independent of growth and development in the area, since the extent of flow diversions is a function of flow conditions and available downstream capacity.

3.2 DRG WQTC PLANNING AREA

As previously noted, MSD has the legal authority and responsibility to provide wastewater collection and treatment services within Jefferson County. The DRG WQTC service area is divided into two areas that coincide with the watersheds of Pond Creek and Mill Creek. The Pond Creek service area and the Mill Creek service area provide flow to the DRG WQTC via

Figure: 3-1

DEREK R. GUTHRIE FACILITES PLAN UPDATE
LOUISVILLE AND JEFFERSON COUNTY
METROPOLITAN SEWER DISTRICT

EXISTING WASTEWATER INFRASTRUCTURE AND SERVICE AREA

- MSD Regional Treatment Plant
- MSD Treatment Plant
- Private Treatment Plant
- Streams
- Expressway
- Major Roads
- Jefferson County Boundary
- Pond Creek Watershed
- Mill Creek Watershed
- Currently Not Serviced
- Planning Area Boundary

Sanitary Pump Stations

- MSD
- Private
- P - Operated by MSD

Sewers

- Interceptor
- Sewers

N
W E
S

0 0.75 1.5 Miles

1 inch equals 1.5 miles

Bullitt County

ID Number	Unit ID	Pump Station Name
151	MSD0044-PS	JACKS LANE
153	MSD0043-PS	PIONEER
160	MSD0047-PS	FERN LEA
162	MSD0049-PS	ROSA TERRACE
163	MSD0048-PS	CITY PARK
164	MSD0142-PS	SIX MILE LANE
170	MSD1200-PS	PIROGUE COURT
174	MSD0050-PS	GARRS LN
175	MSD1201-PS	MODES TO ROAD
176	MSD1202-PS	SHANNON RUN
178	MSD1203-PS	KIRBY LANE
179	MSD0052-PS	MILL CREEK
182	33883-PS	CAN RUN RD
183	MSD0053-PS	SANDERS LANE
195	MSD0054-PS	EAST ROCKFORD LANE
200	81642-PS	CHOSEN CHILDRENS HOME
203	MSD0137-LS	PICCADILLY
204	MSD1047-LS	PARKWOOD
210	MSD0160-PS	BRANDYWYNE CT
215	MSD0099-PS	POPLAR LEVEL
218	MSD1048-PS	EDSEL
223	MSD1003-PS	INDUSTRIAL
225	MSD0154-PS	BROADFERN DRIVE
228	MSD1010-PS	LEA ANN WAY
241	63573-PS	FEGENBUSH

ID Number	Unit ID	Pump Station Name
242	MSD0143-PS	PARK RIDGE WOODS
245	MSD0180-PS	GOVERNMENT CENTER
246	88377-LS	ALL TUNE & LUBE
254	98652-PS	MIDLAND
257	82257-PS	OUTER LOOP
258	35686-LS	ROBERTA PARK MHP
262	MSD0140-PS	TREE LINE
268	MSD1051-PS	ADMIRAL
269	MSD0258A-LS	SILVER HEIGHTS WQTC INFL PS
272	MSD0101-PS	LANTANA DRIVE #1
276	92658-PS	KEYS FERRY RD
277	MSD1008-PS	FRANCELL
278	MSD0120-PS	SUNLIGHT
279	55347-PS	CHATAMWOOD DR
280	MSD0133-PS	CAVAN AVE
281	MSD0228A-PS	MCNEELY LAKE WQTC INFLUENT PS
282	MSD1031-PS	BROOKBEND
283	MSD1019-PS	LEVEN
284	MSD0164-LS	ORELAND MILL
285	MSD1020-PS	MUD LANE
287	MSD0112-PS	HASBROOK
290	MSD0198-PS	GARDEN TRACE
291	79465-LS	AUTUMN LAKE MHP
292	32626-LS	DAIRYMART STORE
293	MSD0111-LS	VALLEY VILLAGE

ID Number	Unit ID	Pump Station Name
298	104336B-LS	SHACKLETTE ELEMENTARY
340	MSD0072-LS	VILLA ANA
360	107691-LS	ELDERBERRY RIDGE
361	107667-LS	CHERRY BLOSSOM
380	MSD1042-PS	APPLE VALLEY
392	81844-PS	BOARD OF EDUCATION
408	MSD1183-PS	RIVERSIDE GARDENS
410	MSD1182-PS	WOODLAND-BARBER
423	MSD0277A-PS	DEREK R. GUTHRIE WQTC PS
431	MSD1147-PS	MOUNT WASHINGTON ROAD
441	64062-PS	QUAIL CHASE GOLF COURSE
442	MSD0103-PS	MCNEELY LAKE
449	50911A-PS	
450	50911B-PS	
465	112832-PS	GLOBAL PORT
476	MSD0055-LS	SHIVELY
477	107341-PS	BLUELICK OPTIMIST CLUB
478	MSD1143-LS	BAY HARBOR CT
494	MSD0130-PS	COOPER CHAPEL
504	MSD1013-PS	CINDERELLA
510	MSD1192-PS	WAL-MART SUPER CENTER #3610-00
3203	MSD0195-PS	JEFFERSON HILL
3842	42167-PS	AUTUMN LAKE PUMP STATION

Map Prepared by MSD GIS Services and Records

Map Created: 7-APR-2017

U:\msd\Shared Maps\DRG Action Plan Update\MXDs\Existing Infrastructure.mxd

two main interceptors, the Pond Creek Interceptor and the Mill Creek Interceptor. These areas are currently modeled separately using Infoworks ICM. The models are calibrated and can be used to predict the increased flows during wet weather when inflow and infiltration peaks.

3.3 COMBINED DRG WQTC AND MFWQTC PLANNING AREA

The DRG WQTC service area increases in size during wet weather. During rain events, flow is diverted at the Northern Ditch Pump Station Diversion Structure in order to reduce flow to the MF WQTC for the reduction of Combined Sewer Overflows (CSOs). Figure 2-1 shows the dry weather service area and the wet weather diversion area.

3.4 GEOLOGY AND GROUNDWATER

The planning area lies within the Ohio River Alluvium physiographic region of Kentucky. The Ohio River Alluvium is primarily made up of Pleistocene glacial outwash material and unconsolidated alluvium, which consists of sand, gravel, clay, and silt. Regionally, the lithology is comprised of a 5 to 45-feet thick layer of clay, silt, and fine sand that overlays sand and gravel containing discontinuous lenses of clay. Beneath the aquifer are relatively tight shale and limestone bedrock (USGS, 1986).

3.5 TOPOGRAPHY AND FLOODPLAIN

The planning area is divided into two watersheds, Mill Creek watershed and Pond Creek watershed. Figure 3-2 shows a visual depiction of the terrain through color shading. The Mill Creek area is relatively flat, with low, undulating features. Portions of the Pond Creek watershed contain gentle to steeply graded hills, underlain with limestone. These are primarily in the southern and easternmost areas.

The Mill Creek area encompasses 34 square miles with 71 stream miles. The relatively flat and low relief terrain of the old Ohio River floodplain characterizes the landscape. Mill Creek and Black Pond Creek drain the northern portion of the basin. Black Pond Creek empties into Mill Creek near Valley Station. The cumulative flow discharges into the Ohio River near the DRG WQTC. Figure 3-3 shows a USGS map with contour lines and other physical characteristics of the area.

The floodplain consists of slack water areas, very flat terraces and old ridges deposited by the river as shown in Figure 3-4. Slopes are generally in the 0 to 5 degree range. The shallow valleys of small streams flowing into the Ohio River cut the broad, level ridges. The area is underlain by glacial outwash, where the upper deposits consist of recent alluvium of sand, silt and clay. The underlying sand and gravel act as a very extensive aquifer and most groundwater flow in the area occurs in the glacial, granular materials of the river valley.

Figure: 3-2

DEREK R. GUTHRIE FACILITES PLAN UPDATE
LOUISVILLE AND JEFFERSON COUNTY
METROPOLITAN SEWER DISTRICT

TOPOGRAPHY

- MSD Regional Treatment Plant
- MSD Treatment Plant
- Private Treatment Plant
- Streams
- Expressway
- Major Roads
- Jefferson County Boundary
- Pond Creek Watershed
- Mill Creek Watershed
- Planning Area Boundary

N
W E
S

0 0.75 1.5 Miles

1 inch equals 1.5 miles

Map Prepared by MSD GIS Services and Records

Map Created: 7-APR-2017

J:\msd\shared\Maps\DRG Action Plan Update\MXDs\Topography.mxd

Figure: 3-3

DEREK R. GUTHRIE FACILITES PLAN UPDATE
LOUISVILLE AND JEFFERSON COUNTY
METROPOLITAN SEWER DISTRICT

USGS
Louisville West

- MSD Regional Treatment Plant
- MSD Treatment Plant
- Private Treatment Plant
- Streams
- Expressway
- Major Roads
- Jefferson County Boundary
- Planning Area Boundary

N
W E
S

0 0.75 1.5 Miles

1 inch equals 1.5 miles

Map Prepared by MSD GIS Services and Records

Map Created: 7-APR-2017

J:\msd\Share\Maps\DRG Action Plan Update\MXDs\Planning_Area_Location.mxd

Figure: 3-4

DEREK R. GUTHRIE FACILITES PLAN UPDATE
LOUISVILLE AND JEFFERSON COUNTY
METROPOLITAN SEWER DISTRICT

100-YEAR FLOOD PLAIN

- MSD Regional Treatment Plant
- MSD Treatment Plant
- Private Treatment Plant
- Streams
- Expressway
- Major Roads
- Jefferson County Boundary
- Pond Creek Watershed
- Mill Creek Watershed
- Currently Not Serviced
- Planning Area Boundary
- Floodplain
- Floodway

N
W E
S

0 0.75 1.5 Miles

1 inch equals 1.5 miles

Map Prepared by MSD GIS Services and Records

Map Created: 7-APR-2017

J:\msd\shared\Maps\DRG Action Plan Update\MXDs\100yr Flood Plain.mxd

However, the recent alluvium deposited over the glacial material is frequently fine-grained, predominantly silt and silty clay loam. The infiltration of the water into these underlying materials is irregular and occurs only where the surface materials are clean, granular soil. Consequently, most of the area experiences deep seated groundwater flow with significant runoff. The floodplain's flat, broad ridges and terraces would constitute an ideal recharging area, if it were not for the widespread deposit of recent alluvium consisting of virtually impermeable silt and clays. The extensive areas of fine grain silt and clay causes predominantly surface runoff and evapotranspiration.

The Mill Creek watershed area is part of the Ohio River Floodplain, with a flood hazard area of 3.5 square miles. Most flooding occurs during the 4 month period from January through April. All of the high floods have occurred during this period.

The Pond Creek watershed encompasses 63 square miles and is roughly shaped like a rectangle with a finger that extends northeast. On average, the dimensions of the Pond Creek area are 17.1 miles from east to west and 3.7 miles from north to south.

The Pond Creek watershed contains a variety of topographical features. The eastern portion of the area is marked by karst prone topography, where small sinkholes are common. The karst topography also provides rolling hills that drain into flat areas in the northern portion of the Pond Creek watershed. The moderately steep rolling hills allow run-off to reach the flat plain areas quickly, where the flat areas serve as local floodplains for many streams and drainage channels. Slopes within the rolling hills are typically between four and 8 percent with elevations up to 600 feet but commonly near 500 feet. Elevations in the flat plains are in the range of 420 to 460 feet, which provide minimal topographic relief for the streams and channels to reach the Salt River and ultimately the Ohio River. The southern portion of the Pond Creek planning area includes the karst prone steep hills of the Jefferson County Memorial Forest that commonly contain elevations of 850 feet (National Geodetic Vertical Datum of 1929).

To reduce losses due to flooding and control development within the floodplain, Jefferson County and other agencies, including U.S. Army Corps of Engineers, have pursued flood damage reduction measures. The county floodplain ordinance discourages and restricts development in the floodplain and floodway. The U.S. Army Corp of Engineers has managed the development of two detention basin sites, Melco and Vulcan. The Melco Basin is located at Northern Ditch just south of the Ford Plant near Grade Lane and Outer Loop. The other basin was developed from the former Vulcan Limestone Quarry, located on Fishpool Creek near Blue Lick Road and South Park Road. Both basins provide additional flood protection for residents near the Northern and Southern ditches.

The purpose of floodplain regulation is to prevent construction in the floodplain or floodways. Construction in the floodplain and floodways increases flooding frequency and depth. In 1978, Jefferson County adopted its first floodplain management controls. In 1987, MSD became responsible for drainage controls in the area.

3.6 PLANNING AND ZONING

Land function can provide insight into the current areas of development, undeveloped areas, agricultural presence and forested regions. Two references were used that provided details on the DRG WQTC Planning area land use characteristics; Figure 3-5 Land Use and Figure 3-6 Zoning. Apparent differences or conflicts between the two can be attributed to several reasons, including land uses established prior to zoning regulations, or to approved variances through the planning process.

3.7 NATIONAL LAND COVER DATA 2011

Federal agencies partnered to produce a nationwide land use land cover geographical information system (GIS) shapefile called National Land Cover Dataset 2001 (nlcd01). Aerial photography on a 30-meter grid was analyzed for land use and classified into 16 categories according to the Anderson Land Use/Land Cover Classifications. The DRG WQTC planning area land use result demonstrates high percentages of Single Family Residential and Vacant land covering a total of 87.9 percent as shown in Table 3-1 and Figure 3-5. The developed land area classifications are 92.1 percent.

Table 3-1 2011 National Land Use Data

Category	Area (Acres)	Percent (%)
Commercial	2,162	2.7%
Farmland	276	0.3%
Industrial	883	1.1%
Multi-Family Residential	980	1.2%
Parks and Open Space	947	1.2%
Public and Semi Public	2,097	2.6%
Right of Way	2,336	2.9%
Single Family	65,182	81.5%
Vacant	5,132	6.4%
Total	**79,995**	**100%**

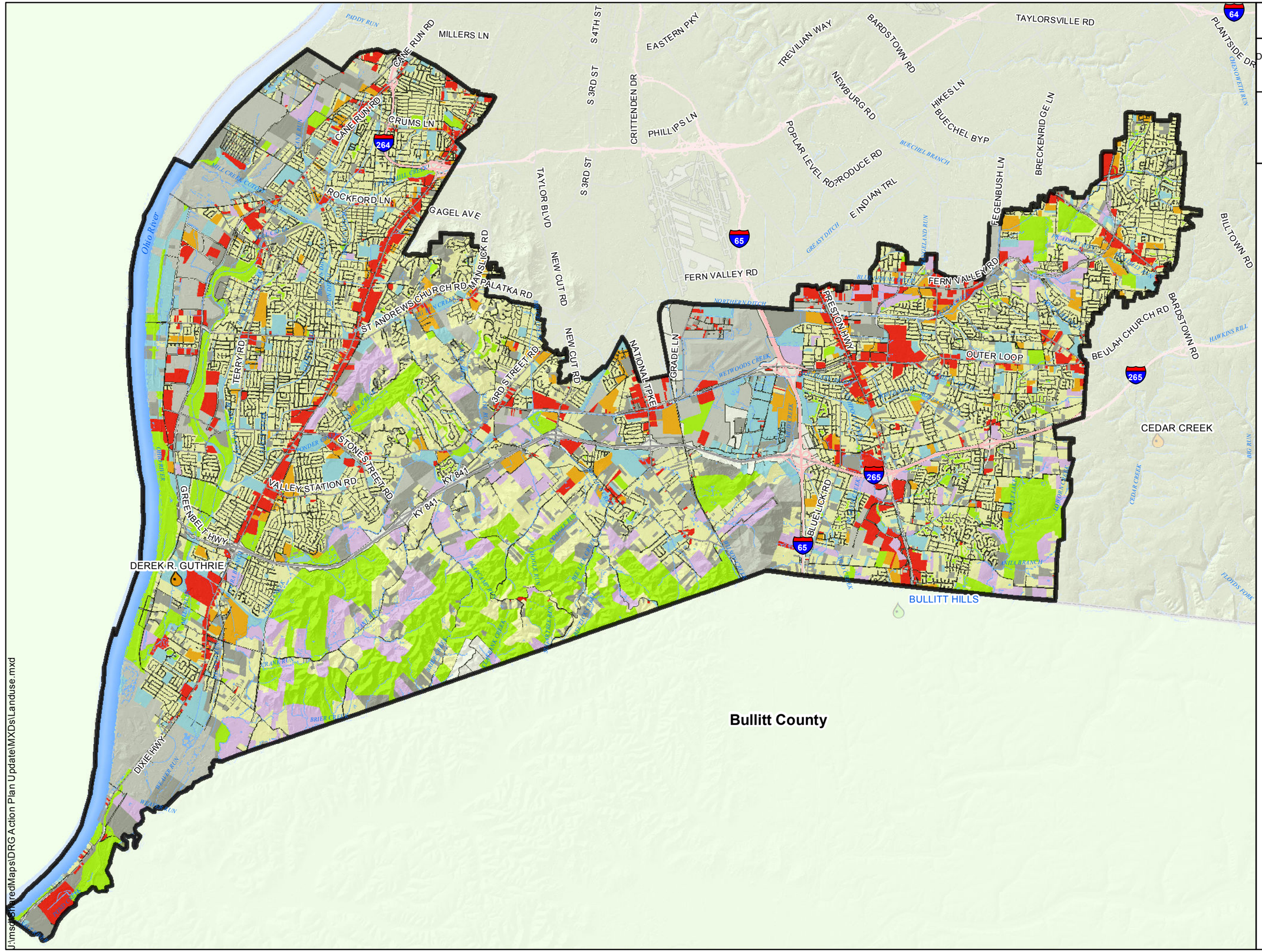
3.8 LOUISVILLE METRO ZONING

The DRG WQTC planning area is divided into Metropolitan Zoning types as shown in Table 3-2 and Figure 3-6. Residential is the dominant zoning classification in the DRG planning

Figure: 3-5

DEREK R. GUTHRIE FACILITES PLAN UPDATE
LOUISVILLE AND JEFFERSON COUNTY
METROPOLITAN SEWER DISTRICT

LAND USE



- MSD Regional Treatment Plant
- MSD Treatment Plant
- Private Treatment Plant

Landuse *

- Commercial
- Industrial
- Mulit-Family Res
- Parks and Open Space
- Public and Semi-public
- Farmland
- Single Family Res
- Right-of-way
- Vacant or Undeveloped
- Streams
- Expressway
- Major Roads
- Jefferson County Boundary
- Planning Area Boundary

Note:
** Landuse is based on National Land Cover Data 2011*

N
W E
S

0 0.75 1.5 Miles

1 inch equals 1.5 miles

Map Prepared by MSD GIS Services and Records

Map Created: 7-APR-2017

J:\msd\shared\Maps\DRG Action Plan Update\MXDs\Landuse.mxd

Figure: 3-6

DEREK R. GUTHRIE FACILITES PLAN UPDATE
LOUISVILLE AND JEFFERSON COUNTY
METROPOLITAN SEWER DISTRICT

ZONING

MSD Regional Treatment Plant
MSD Treatment Plant
Private Treatment Plant

Zoning
- Commercial/Industrial
- Industrial Only
- Business/Office
- Residential
- Special
- Streams
- Expressway
- Major Roads
- Jefferson County Boundary
- Planning Area Boundary

N
W E
S

0 0.75 1.5 Miles
1 inch equals 1.5 miles

Map Prepared by MSD GIS Services and Records

Map Created: 7-APR-2017

U:\msd\Shared\Maps\DRG Action Plan Update\MXDs\Zoning.mxd

area. The commercial industrial and industrial areas are clustered buffering the major roads and transportation corridors. Zoning areas are not anticipated to significantly change as the watershed develops.

Table 3- 2 Metro Zoning Areas

Category	Area (Acres)	Percent
Commercial- Industrial	9,199.43	11.5%
Industrial Only	4,399.73	5.5%
Business/Office	239.99	0.3%
Residential	63,916.01	79.9%
Special	639.96	0.8%
Other	1,599.90	2.0%
Total	79,995.00	100%